

Track 5

Pipelining in Challenging Areas (Arctic & Offshore)

Track Chair: Joe Zhou - Arctic

Track Chair: John O'Brien - Offshore

Facilitator: P Wood

Track 5 - Pipelining in Challenging Areas

Attendance Breakdown

Approximate total attendance	22
Federal Regulators	4
State Regulators	0
International Regulators	1
Pipeline Industry - <u>Offshore</u>	3
Pipeline Industry - <u>Arctic</u>	5
Standard Organizations	0
Researchers	9
Academics	0
Other	0

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Top 4 Identified R&D Gaps - Arctic

Gap #1 – Strain-Based Design (SBD) (Consensus Standard and General Knowledge)

Representative R&D

Develop comprehensive guidelines for SBD - Needs to be supported by numerous technical projects

- Guidelines for strain demands from permafrost related hazards and other geo-hazards
- Guidelines for compressive strain capacity
- Guidelines for tensile strain capacity

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Top 4 Identified R&D Gaps - Arctic

Gap #2 – Reliability-Based Design & Assessment (RBDA) (Consensus Standard and General Knowledge)

Background

- Generic RBDA standard published by ISO 16708 in 2006
- CSA Z662 published a non-mandatory Annex O in 2007
- Review process in ASME B31.8 started in 2003 and continuing – need to be revitalized

Representative Developmental Activities - Require funding

- Complete the standard development with B31.8 and publish the RBDA standard as a supplement
- Extend the RBDA methodology to other type of pipelines
- Gain regulatory acceptance

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Top 4 Identified R&D Gaps - Arctic

Gap #3 – Quality Management System (QMS) (Consensus Standard and General Knowledge)

Background

- Various forms of QA/QC program widely implemented
 - Ranging from based on minimum standards to substantial supplemental company specific program
 - Varying performance
- TransCanada has piloted QMS approach as the basis for a number of pre-service hydrotest waivers
- QMS is an essential element of overall pre-commissioning of pipeline integrity, particularly in the arctic

Representative R&D - Quality Management Systems (QMS)

- Develop guidelines for a QMS for pipeline projects (from design to commissioning) to ensure consistent and acceptable quality that is
 - Comprehensive in scope
 - Flexible in process and procedure
 - Effective in achieving consistent and acceptable quality
 - Adequate and acceptable to demonstrate pipeline safety and integrity without pre-service hydrotest

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Top 4 Identified R&D Gaps - Arctic

Gap #4 – Metallurgy & Materials Performance (General Knowledge)

Representative R&D

Pipe Materials - Recommended Program

- Guideline for application and specification of SBD pipe
- Guideline for application and specification of X100 pipe (includes data collection requirement)

Coating Materials - Recommended Program

- Enhance/refine 3-layer coating systems for Arctic applications
- Guidelines for application and testing of girth weld coatings

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Top 4 Identified R&D Gaps - Arctic

Gap #4 – Metallurgy & Materials Performance (General Knowledge), continued

Representative R&D, continued

Welding - Recommended Program

- Develop high productivity welding “systems” to deliver quality and consistent welds
 - Continue current projects (PRCI MATH-1)
 - Extend to tie-in and repair welds as necessary
 - Implement into guidelines and standards
- Develop guidelines for avoidance of hydrogen induced cracking of high strength steels
 - Welding factors
 - Delay time before final inspection

NDT - Recommended Program

Develop industry guidelines and standards for:

- System design
 - How to design/specify system matched to needs
- System qualification
 - POD and Accuracy
- Operator qualification

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Additional Identified Gaps - Arctic

- Validation of Flaw (non-corrosion) Assessment Methods for High Strength Materials at Low Temperatures
- Horizontal directional drilling through permafrost/partial permafrost regions
- Coating Design & Performance in Field Construction & Long-Term Arctic Application (rocky soil or rock)
- Criteria for When Post-Weld Heat Treatment is Needed
- Joining Technologies
- NDE Technologies – Post-Construction
- Human Factors equipment design should accommodate decreased dexterity and mobility as well as the effects of very low temperatures and low lighting on productivity

Top 3 Identified R&D Gaps - Offshore

Gap #1 - Construction Issues (Technology, Consensus Standard and General Knowledge)

- Welding and NDE solutions for heavy wall pipe up to 2”
- Substitutes for hydrotest (Alternate Integrity Verification - AIV) supporting commissioning
- Pipeline construction inspection of Corrosion Resistant Alloys (CRA)
- Subsea Quality Management System (QMS) - guidance development

Top 3 Identified R&D Gaps - Offshore

Gap #2 – Damage Evaluation (Technology, Consensus Standard and General Knowledge)

- Need to develop a unified process for evaluating damage to subsea pipelines
- As with onshore pipelines, a grading tool is essential to support operator decisions on prioritizing their responses to damage
- Use testing to reduce uncertainty
- Standardized analysis methods for establishing tensile & strain loads

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Top 3 Identified R&D Gaps - Offshore

Gap #3 – Integrity Inspection (Technology, Consensus Standard and General Knowledge)

- SMART Pigs for ultra deepwater pipeline inspection
- Multi diameter pigging capability 8” ID variations
- Assessment of NDE technologies for outside the pipe inspection of internal corrosion on subsea flowlines
- Improving inspectability of gas pipelines & risers in the absence of liquids
- Subsea pipeline damage - inspection & protocol guidelines
- Evaluation of MTM technology (on & offshore applications) inspection

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Additional Identified Gaps - Offshore

- Non Piggable Pipelines - Access Issues, Inspectability, Cleaning, Base resource document for unpiggable pipelines (all sectors)
- Extreme Weather Loading, Landfall/near-shore seabed stability, collision issues
- Composite Repairs Techniques For Offshore Risers, Splash zone repair techniques - challenges
- Study on optimization of inhibitor use
- Pipe In Pipe Pipeline Inspection; Pipe in pipe CP criteria - isolation etc
- Coating performance on subsea pipelines
- Corporate knowledge/industry knowledge access (solves ageing process); authoritative reviews of R&D
- Integrity installed sensors
- Probabilistic approaches for life assessment
- Spiral welded pipe for subsea application